

Camel Milk As An Alternative Therapy For The Treatment of Type-1 Diabetes: Verification of a Traditional Ethno-Medical Practice.

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Abstract

Total of fifty-four randomly selected type1 diabetic patients were divided into two groups. Group 2 (N=27) received usual care (diet, exercise and insulin) and patients in group3 (N=27) received a daily 500 ml camel milk each in addition to usual care to assess the effect of camel milk on glycemic control and diabetic quality of life in patients of type 1 diabetes mellitus.

Frequent blood sugar monitoring was done by titrating doses of insulin. Baseline data of the experimental groups were similar in demographic and clinical variables. At the end of one month treatment period, there was a significant improvement in fasting blood sugar (127.00 ± 7.00 to 109.4 ± 8.8), HbA1c (9.59 ± 2.05 to 7.57 ± 2.429) and a significant reduction in insulin requirement (mean doses of insulin 41.66 ± 15.64 in group 3 receiving camel milk in comparison to patients of group2).

A reduction 40.83 ± 6.98 Vs 29.66 ± 15.64 (**units/day**) in insulin doses in 92% of patients of group 3 was indicated. There was also an improvement in satisfaction score ($P < 0.001$), impact score ($P < 0.001$), with patients receiving camel milk.

Camel milk was indicated to be an effective supplementation in the management of type 1 diabetes reflected in a significant reduction in insulin doses along with improvement in different parameters of diabetes and quality of life.

Abbreviations: CLIA=Chemiillum inescence; lipoproteins; LDL=HbA1c=Glycoselated Hemoglobin; HPL = high density Low density lipoproteins; BM1=Body Mass Index; TG=Triglyceride.

Introduction

Type 1 diabetes mellitus is a common endocrine disorder, characterized by chronic hyperglycemia and disturbances of carbohydrates, fat and protein metabolism associated with insulin deficiency. Its primary treatment is insulin replacement, however at present neither entire physiological insulin replacement could be achieved in clinical practice nor could metabolic disturbances be normalized. Insulin therapy is still the best treatment, however, among certain social groups needle phobia, cost and routine treatment persuade patients to adopt alternative treatments in the context of traditional ethno-medical practices. In this connection we have heard of many folkloric stories which describe the use of camel milk in the treatment of type-1 diabetes mellitus. There is also an account in memories of Emperor **Jahangir (1579-1627 AD)** referring to the usefulness and acceptability of camel milk (**Regers, 1989**). One of the camel milk proteins has been reported to have similar characteristics to insulin (**Beg et al. 1986a**).

Several studies have been carried out at the Zayed Complex, UAE showed that camel milk has the IgA and IgG that have proved effective against several viral and bacterial Pathogens (**Khitam ,2003**). Camel

milk does not form coagulum in acidic environment (**Wangoh, 1993**). The lack of coagulum formation allows the camel milk to pass rapidly through the stomach together with the specific insulin like protein/insulin and remains available for absorption in intestine. Radio immunoassay of Insulin in Camel milk has revealed high concentration i.e. 52 units/liter (**Singh, 2001**).

Hull S.J.,(2004) sated that the milk of the camel has traditionally been used to treat diabetes.

Daily milk production of good feeding she camel (10–15 kg) was obtained (**Shalash, 1979**) which yield of approximately 3–4 kg per lactation. Camel milk was therapeutically used against dropsy, Jaundice, problems of the spleen, tuberculosis, asthma, anaemia, and piles (**Rao et al., 1970**) and other lung ailments (**Gast et al., 1963**) and has proven beneficial in the treatment of tuberculosis (**Akundov et al., 1972**).

Material and Methods:

Patients

A total of 54 type 1 diabetic patients were randomly recruited at the outpatient diabetic clinic, Faculty of Medicine, Menofia University. All subjects gave

signed informed consent before participation in this study.

The patients were advised to follow strict diet, exercise and insulin treatment for 1 month. During this period frequent monitoring of blood sugar was done to keep euglycemia and patients were randomly divided into two groups:

Group 1: Healthy people (N=10) received usual care i.e. diet exercise.

Group2: patients (N=27) received usual care i.e. diet exercise and insulin.

Group3: patients (N=27) received daily 500 ml of camel milk each in addition to usual care.

Patients with acute metabolic complications like hypoglycemia, ketoacidosis, cardiovascular event, renal or acute infections were not included in the study.

Experimental Design

This was a randomized, open case control, parallel design study. Blood sugar was measured twice in a week before breakfast and before dinner and insulin doses were weekly titrated according to blood sugar level. HbA1c, plasma lipids and insulin were initially measured and after one month. Body mass index, waist hip ratio and “diabetes quality of life” score were likewise measured.

Assays:

Plasma glucose concentration was measured using the glucose oxidase method. Plasma insulin and C-peptide were estimated by (CLIA test). Anti-insulin antibodies were estimated by radioimmunoassay. HbA1c was measured by high performance liquid chromatography (HPLC). Serum Total Cholesterol. Triglycerides, VLDL, HDL were estimated by fully automated biochemistry analyzer. Urine micro-albumin was tested by Micral test. Quality of life was weekly assessed by diabetes quality of life questionnaire (The Diabetes Control and Complications Trial Research Group, 1996).

Statistical Analysis:

Statistical calculations were performed using SPSS 12.0 Computer software. Values before and after treatment within each group were analyzed by using paired student's test. Data were prepared as mean \pm S.D. P value <0.05 was considered statistically significant.

Results:

Demographic characteristics are summarized in Table 1. The group 1 (control group) and group 2 (camel milk group) were similar in age (57.13 ± 4.1 Vs 56.4 ± 9.64). Sex (19M/8F in both groups), body mass index

(30.3 ± 7.49 Vs 29.82 ± 8.39), Fasting blood sugar (127 ± 7.0 Vs 109.4 ± 8.8), serum insulin (14.72 ± 1.41 Vs 18.6 ± 5.057), serum lipids along with different clinical, demographical and biochemical variables (Table 1).

After one month of treatment there was statistically significant increase in body mass index, and improvement in fasting blood and in HbA1c, in the camel milk group.

These parameters were slightly increase in group 2 patients (Table 2). Fasting serum insulin levels did not reveal a significant change in either group and so were the levels of lipid profile, after 1 month of treatment.

The diabetes quality of life questionnaire score significantly changed in favor of camel milk Table ($p < 0.05$), There was a significant reduction in the mean doses of insulin (41.66 ± 15.64 to 29.16 ± 13.05) ($p < 0.05$) in patients receiving camel milk (Table 3). The acceptability of camel milk was fairly good and only one patient complained of flatulence that disappeared after 3-4 days. Mild diarrhea (2-3 semisolid) was reported by nine patients who also subsided spontaneously.

Discussion

The present study intended to explore the grounds on which a traditional belief is based as to a potential for camel milk component(s) that might have a role in achieving glycemic control in type-1 diabetic patients. a significant improvement were observed in all biochemical parameter

After 1 month of camel milk treatment. The positive effect in weight gain and stability in lipid profile of the experimental group may be attributed o the good nutritional value and relatively lower fat percent and extremely low cholesterol of camel milk

It was also observed significant reduction in insulin doses to obtain glycemic control along with significant improvement in HbA1c level at the end of one month. No other studies were available for comparison. Improvement in micro albuminuria may be due to good glycemic control or may directly due camel milk.

There was a marked improvement in diabetes quality of life score after one month of camel milk treatment, this could be a result of an improved glycemic control or anabolic effect of camel milk. El- Agamy (1992) found good amount of lysozyme, lactoferrin, lactoperoxidase, immunoglobulin G and secretary immunoglobulin A in camel milk.

Requirement of mean doses of insulin/day before treatment in patients of group-3 was 41.66 ± 15.64 . It

rapidly declined during the early experimental stages then gradually reached a mean value of 29.16 ± 13.05 , ($p < 0.05$). Out of 27 patients, only one patient required the same doses of insulin and the other 25 patients had lower requirement.

Camel milk was found to contain about 52 units/liter insulin and it may be the reason for lesser requirement of insulin in camel milk group. Oral insulin has been known since many years but the important drawback is its coagulum formation in acidic media in stomach thereby neutralizing its potency. The lack of coagulum formation may act as an effective vehicle to take the insulin present in it unchanged to the intestine and from there it can be absorbed even if some amount is destroyed in the passage.

Beg et al (1986b) found that amino acid sequence of some of the camel milk protein, is rich in half cystine, which has superficial similarity with insulin family of peptides.

The data of this study shows a significant hypoglycemic effect of camel milk when given as an adjunctive therapy. The action is presumed to be due to presence of insulin/insulin like protein. Its therapeutic efficacy may be due to lack of coagulum formation of camel milk in acidic media. There is no doubt that the discovery and development of oral

insulin for therapeutic use is a Himalayan task. It is important to note that a certain level of scientific testing on camel milk has been already attempted and documented, particularly, insulin levels in camel milk and this scientific wisdom can be a remarkable achievement for diabetic patients.

Camels are probably better known for carrying three wise men than for their ability to lower blood glucose levels but according to folklore, the milk of the camel has traditionally been used to treat diabetes [1, 2]. Surprisingly, camel milk does seem to contain high levels of insulin or an insulin-like protein which appears to be able to pass through the stomach without being destroyed [3]. The stomach's acidity would normally destroy insulin – this is why developing 'oral insulin' is such a challenge. A small month-long study in people with Type 1 diabetes (which does not appear to have been formally published) suggested that drinking almost a pint of camel milk daily improved blood glucose levels, reducing the need for insulin. [3]

Saitmuratova et al (2002) stated that the Proteins of camel's milk and shubat were studied by electrophoresis. Their microelement compositions were determined. Electrophoresis showed two bands in camel's milk and several in shubat. It was found that

Fe and Zn occur in greater quantities in both camel's milk and shubat than in cow's milk. Also he found that the Camel milk, low in fat and contains no cholesterol which tastes slightly saltier than that of a cow, is far more nutritious. It contains lower fat and lactose, higher levels of potassium, iron and vitamin C, and large concentrations of insulin. Camel milk is used traditionally to treat diabetes.

In 2001 Faye and Wernery said that the analysis of camel milk does show some medicinal potential. The milk protein, lactoferrin, which is present in large quantities in camel milk (ten times higher than in cow milk), does have some anti-viral and anti-bacterial properties. Fermented camel milk is high in lactic bacteria, which have been shown to be effective against pathogens including *Bacillus*, *Staphylococcus*, *Salmonella* and *Escherichia*. Vitamin C content in camel milk is generally double what is found in cow's milk. And, in Russia, Kazakhstan and India, there are many examples of where camel milk - as much as a litre a day - has been prescribed to hospital patients to aid recovery from tuberculosis, Crohn's disease and

diabetes.

A natural component of cows and human mothers' milk, lactoferrin is also found throughout the human body; it occurs in all secretions that bathe mucous membranes, such as saliva, tears, bronchial and nasal secretions, hepatic bile and pancreatic fluids. Exactly how lactoferrin exerts all of its immune modulating or immune enhancing functions is not entirely clear, but it is known to enhance the immune response both directly and indirectly (passively) in response to a wide range of immune challenges, and is an essential factor in the immune response in humans.

The camel's hump is not, as popular myth suggests, filled with water, but is where it stores most of its body fat. As a result, the meat from the rest of its body especially healthy, as it is low in fat and contains no cholesterol. Camel milk, which tastes slightly saltier than that of a cow, is far more nutritious. It contains lower fat and lactose, higher levels of potassium, iron and vitamin C, and large concentrations of insulin. Camel milk is used traditionally to treat diabetes. (Hamers-, et al.,1993)

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Table1. Base Line Clinical Biochemistry Characteristics of Groups under Study.

Variables \ Gruops	Control Group 1 n=10	Group 2 n=27	Group 3 n=27	P
	Mean \pm SD	Mean \pm SD	Mean \pm SD	
Age (Yrs)	56.4 \pm 5.73	57.13 \pm 4.1	56.4 \pm 9.64	0.51
Sex (M/F)	6M/4F	19M/8F	19M / 8F	
Duration of Diabetes (Yrs)	No-diabetes	9.10 \pm 3.32	9.37 \pm 4.5	0.186
BMI (Kg/m ²)	25.3 \pm 7.93	30.3 \pm 7.49	29.82 \pm 8.39	0.808
HbA1c(%)	6.8 \pm 1.08	9.59 \pm 2.05	7.57 \pm 2.429	0.143
Dose of Insulin(units/day)	No-treatment	40.83 \pm 6.95	29.66 \pm 15.64	0.831
Fasting blood Sugar (mg/dl)	81.7 \pm 9.16	127.00 \pm 7.00	109.4 \pm 8.8	0.367
Serum Albumin(mg/dl)	4.18 \pm 1.14	3.96 \pm 1.26	4.03 \pm 0.890	0.05
T. Cholesterol(mg/dl)	160.5 \pm 9.5	265.33 \pm 9.09	200.08 \pm 11.04	0.797
HDL (mg/dl)	40.4 \pm 6.23	53.00 \pm 12.57	50.91 \pm 7.86	0.313
LDL (mg/dl)	92.4 \pm 28.64	102.83 \pm 9.63	87.08 \pm 27.86	0.074
VLDLC(mg/dl)	10.65 \pm 3.19	13.41 \pm 4.71	14.0 \pm 5.44	0.801
T.G. (mg/dl)	137 \pm 27.07	170.41 \pm 21.68	106.91 \pm 25.60	0.685
Albuminuria excretion (mg/dl/24 hours)	12 \pm 5.1	23.00 \pm 21.68	27.8 \pm 21.04	0.539
Insulin Level (μ IU/ml)	19.82 \pm 0.75	14.72 \pm 1.41	18.6 \pm 5 0.57	0.067
Anti- Insulin Antibody (%)	18.97 \pm 0.84	20.92 \pm 5.45	25.20 \pm 7.69	0.541
Creatinine Clearance (ml/min)	102 \pm 18.3	92.08 \pm 15.18	75.75 \pm 3.17	0.076

Table 2. Changes in important parameters before and after treatment.

Variables	Group 2 n=27	Group 3n=27
	Mean \pm SD	Mean \pm SD
BMI (Kg/m ²)	25.3 \pm 7.49	19.82 \pm 8.39
HbA1c(%)	9.59 \pm 2.05	8.57 \pm 2.429
Dose of Insulin(units/day)	40.83 \pm 6.98	29.66 \pm 15.64
Mean Blood Sugar (mg/dl)	127.00 \pm 7.00	109.4 \pm 8.8
T. Cholesterol(mg/dl)	265.33 \pm 9.09	200.08 \pm 11.04
HDL (mg/dl)	53.00 \pm 12.57	52.66 \pm 10.54
LDL (mg/dl)	102.83 \pm 9.63	87.08 \pm 27.86
VLDL (mg/dl)	14.41 \pm 4.71	13.0 \pm 5.44
T.G. (mg/dl)	170.41 \pm 21.68	106.91 \pm 25.60
Albuminuria excretion (mg/dl/24 hours)	92.08 \pm 15.18	75.75 \pm 3.17

(Values = Mean \pm S.D.) (*p=<0.05).(p<0.01)

Table 3. Comparisons of mean doses of insulin of group-2 at pre treatment and post treatment.

Variables	Mean doses of insulin	
	0 month	1 month
Mean	41.66 \pm 4.51	29.16 \pm 3.76